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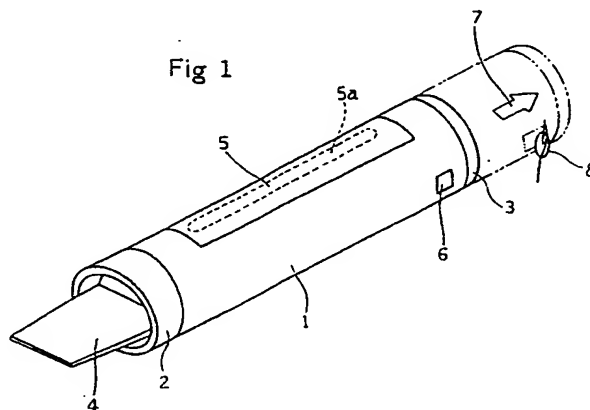
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54 Cartridge discriminating system.

57 A cartridge discriminating system, a toner housing
cartridge adapted for use in such a system and
an image forming apparatus provided with such a
system, wherein a cartridge indicating means is pro-
vided on a part of the toner housing cartridge, and
an indication detecting means for detecting said
cartridge indicating means is provided on the image
forming apparatus for detecting the type or position of
the cartridge inserted in the image forming ap-
paratus.



BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a system for making discriminations between cartridges for housing toners to be equipped on image forming apparatus such as electrostatic copiers, laser beam printers, facsimiles, etc.

2. Description of the Prior Art

Supplementing toner into an image forming apparatus such as afore-mentioned is done in many cases with a cartridge housing toners therein (hereinafter merely referred to as cartridge) loaded in a cartridge inserting part of the image forming apparatus.

Such a cartridge is sealed on its toner supplementing port with a flexible sheet folded in two plies. Accordingly, when supplementing the toner, this cartridge is loaded in the cartridge inserting part such as a toner hopper, etc., on the developing device side. Thereafter, the toner supplementing port is unsealed by stripping off the aforementioned flexible sheet by pulling its turned-up portion, thereby charging the toner into the toner hopper.

Such a conventional toner supplementing device involved following problems:

Conventional toner supplementing devices are of a structure such that even if the loading of a cartridge in a toner hopper is somewhat imperfect, the flexible sheet is strippable. For this reason, the toner supplementing port will be sometimes inadvertently unsealed, notwithstanding the cartridge has not been properly loaded. As the consequence, the toner sometimes scatters through clearances. Particularly, during the image treating operation, the toner has sometimes been blown and leaked out due to the cooling air inside the image forming apparatus or the revolution of toner supplementing rollers, etc.

Cartridges are often so composed as to have a common size, so that their components may be put to common use with different types of image forming apparatuses. Accordingly, when various types of image forming apparatuses are available, there has been a possibility of supplementing toners which are different in properties and color, etc.

A cartridge discriminating system comprising cartridge indicating means provided on a toner cartridge, and indication detecting means cooperating with said cartridge indicating means to check the suitability of the type of the cartridge when the latter is inserted into a cartridge inserting part of an image forming apparatus is known from DE-A-34 15 291. In this prior system the cartridge indicating

means is a flange provided on the toner cartridge, and the indication detecting means is a mating groove provided in a cartridge holder, so that only a cartridge having a flange at the proper position may be inserted into the cartridge holder.

A toner cartridge having a sealing strip which is removably secured to the cartridge and which seals an opening in the surface of the cartridge to prevent discharge of toner particles is known from US-A-4 478 512.

JP-A-61/59 364 discloses a copying machine in which units may be loaded or selectively attached to and detached from the copying machine body. To prevent a wrong unit from being loaded shield plates for different identification information are fitted to the units, and the information presented by the respective shield plate is read by a photosensor mounted on the copying machine body. If on the basis of the output of the photosensor the unit is found to be wrong, an alarm is triggered or the power supply is inhibited.

Furthermore JP-A-61/156 165 discloses a cartridge discriminating system in which magnets are provided at four different locations of the side face of the cartridge housing and four reed switches are arranged at four different locations on a printer main body side so that the switches can face the magnets to thereby detect the respective cartridge.

SUMMARY OF THE INVENTION

An object of this invention is to detect the cartridge inserted in the cartridge inserting part of an image forming apparatus, to see whether or not it has been inserted to its appropriate position, thereby enabling prevention of blow-out leakage of toner.

A further object of this invention is to detect the inserted cartridge, to see whether or not it is an appropriate cartridge having the desired toner housed therein. In that way, it becomes possible to supplement a toner of the specified properties or color, thereby averting the trouble of allowing different types of toners to be mixed.

In conformity with one aspect of the present invention a toner cartridge having a hollow container for housing powdered toner, and cartridge indicating means for indicating the type or position of the cartridge, is characterized in that said cartridge indicating means is a magnetic card, an IC card, a small container containing a developer of the same type as that of the toner and a carrier housed in the cartridge, or a pattern in the form of a logo mark indicating the maker of the cartridge and printed on said cartridge.

According to a further aspect of the subject invention a cartridge discriminating system for an image forming apparatus which is provided with a

replaceable developing equipment for supplying toner to a photoreceptor for developing static latent images, said cartridge discriminating system comprising cartridge indicating means provided on a toner cartridge, and indication detecting means provided on the image forming apparatus and cooperating with said cartridge indicating means for detecting said cartridge when the latter is inserted into a cartridge inserting part of the image forming apparatus is characterized by developing equipment indicating means provided on said developing equipment, developing equipment detecting means provided on the image forming apparatus and cooperating with said developing equipment indicating means for detecting said developing equipment when the latter is attached to the image forming apparatus, and means for checking the suitability of the type of the inserted cartridge by comparing an indication item detected by said indication detecting means with data detected by said developing equipment detecting means.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1

is a perspective view showing cartridge indicating means and indication detecting means adapted for use in the cartridge discriminating system embodying this invention;

Fig. 2

is a perspective view showing a modified embodiment of cartridge indicating means and indication detecting means;

Fig. 3

is a block diagram of control circuit of cartridge discriminating system embodying this invention;

Fig. 4

is a schematic side view of a cartridge insertion preventing means usable with the aforementioned embodiments;

Figs.5(a) and (b)

are, respectively, a perspective view of a cartridge equipped with a cartridge indicating means usable in the same embodiments and a front view of an indication detecting means capable of detecting said indicating means;

Fig. 6

is a flow chart showing the processing procedure in these embodiments;

Fig. 7

is a block diagram of a control circuit usable in a cartridge discriminating system of another embodiment;

Fig. 8

is a flow chart showing the processing procedure of this system;

Fig. 9

is a schematic side view of a modified version of

the cartridge insertion preventing means;

Fig. 10

is a flow chart showing the processing procedure for operating the cartridge insertion preventing means shown in Fig. 9;

Figs.11(a) and (b)

are, respectively, a perspective view of a cartridge equipped with a cartridge indicating means usable with a cartridge discriminating system of another embodiment and a front view of an indication detecting means capable of detecting said cartridge indicating means;

Figs.12(a) and (b)

are, respectively, diagrams for explanation of structure showing essential parts of a cartridge discriminating system of another embodiment of this invention;

Fig. 13

is an electric circuit diagram showing an essential part of a control circuit of the embodiment shown in Fig. 12; and

Fig. 14

is a drawing corresponding to Fig. 12 illustrating a modification of the embodiment shown in Fig. 12.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

In the following description of embodiments, a copier is explained as a typical example of image forming apparatuses. This invention is, of course, applicable to laser beam printers and facsimilies, and other image forming apparatuses.

In a first embodiment, a magnetism producing means exemplifying a cartridge indicating means is provided in apart of a hollow container for housing a powder toner, so that the existence or type of a cartridge may be detected by sensing the magnetism coming from said magnetism producing means and, moreover, that the copying operation may be stopped so as to avoid producing reject.

In the following, detailed explanation is given using accompanying drawings:

Fig. 1 is a perspective view of the whole of a cartridge.

Both ends of a hollow cylinder 1 for housing powder toner in its interior are closed with resin made covers 2, 3 and on the cover 2, there is provided a handle part 4 for turning the opening part 5a of the cartridge toward the toner supplying port of a developing section, after inserting the cartridge into the copier. The opening part 5a is sealed with a sealing member 5 which is to be stripped off, after the cartridge has been loaded in a copier.

In a part of the cartridge, a magnetic card 6 is provided which enables the type, date of manufac-

ture of the toner housed or the color, in the case of color toners, etc., to be written in. The position where the magnetic card is placed is where it is nearest to and facing a magnetic head 8 mounted on a copier, when the cartridge has been brought under its toner supplementing state by inserting it into the cartridge inserting part, as shown by an arrow 7. The information written into the magnetic card 6 will be read out by the magnetic head 8, to conduct functions of a copier such as operation, stop and copying speed change, etc. Particularly, the operation of the copier may be stopped, as the case maybe, lest unacceptable image be erroneously formed. For this purpose, a well-known mechanism which makes the indication as well as making the copier immovable, when no paper feeding cassette nor copying paper of the copier exists, is applicable.

As other examples of combinations of cartridge indication means and indication detecting means, those adapted for detecting such patterns as employed in embodiments shown in Figs. 3 - 12 may be utilized.

Further, as a means for making a large capacity of memory storage on a small area, like magnetic card, IC card may be mentioned, besides it. As characteristics of the toner to be stored on magnetic card or IC card, the production date, color of toner, and production related items such as guarantee period, manufacturing place, manufacturing machine, lot number, etc., or physical properties related items such as various specific gravities, grain size distribution, electric resistance, etc., may be mentioned. As an indication detecting means provided on the copier side for reading out the IC card, a well-known analyzer is used.

In an embodiment shown in Fig. 2, in part of a hollow container, a compartment is formed, to house a developer formed of a toner and a carrier. The existence of an appropriate toner cartridge is detected by sensing the permeability of the developer with a magnetic sensor located on the side of the copier.

Generally, a copier is of a structure such that a magnetic sensor called toner control sensor for keeping constant the toner concentration in the developer is provided in a developing apparatus, to make supplementation of toner, when the toner concentration has undergone a change (it normally declines). This embodiment takes advantage of this phenomenon; thus, as shown in Fig. 2, a small container 9 is provided in a part of a cartridge, to house therein a developer consisting of a toner and a carrier being a magnetic body which ensures the best conditions for the copier.

The specified place is where it is brought to a neighborhood of and facing a permeability sensor 11 being an example of magnetic sensors mounted

on a copier, when the toner supplementing state is brought about by loading a cartridge in the cartridge inserting section. If the permeability of the developer 10, as sensed by a permeability sensor 11, falls within the permissible range, as compared with the value of permeability which has been preset, the copier will be operated. If values outside this range are detected or no permeability is sensed, absence of appropriate cartridge will be indicated by whatever means. The copier's operation is to be stopped, as the case may be, lest unacceptable image be erroneously prepared. Accordingly, the well-known mechanism that makes indication or makes the copier inoperable, when no paper feeding cassette or copying paper of the copier exists will be usable. If such a permeability sensor 11 is used in common with an already installed permeability sensor for detecting the developer concentration inside the developing apparatus, reduction in cost will be further promoted.

In the devices shown in Fig. 2, same reference numbers are used for elements common to those shown in Fig. 1 without giving their definitions.

In the afore-mentioned embodiment, the suitability of cartridge or whether it is adequately inserted or not is detected, when the cartridge is in the state of being inserted to the toner supplementing position. However, particularly, for detecting the suitability of a cartridge, there is no necessity of inserting the cartridge to the toner supplementing position. But it is rather desirable to make the judgement of suitability in the state that only the tip part of the cartridge is a little inserted. This will facilitate the operation.

In embodiments represented by Figs. 3 - 12, this concept is particularly taken into account.

Thus in the following embodiments, while a cartridge indicating means is provided on a part of a cartridge for housing toner, an indication detecting means for detecting the afore-mentioned cartridge indicating means and a cartridge insertion preventing means for preventing complete insertion of the cartridge are provided on the image forming apparatus side, so that when the cartridge has been inserted in the cartridge inserting part of the image forming apparatus, the type suitability of the cartridge inserted is checked by the afore-mentioned indication detecting means; then, only when a proper cartridge is inserted, its perfect insertion will be permitted by unlocking the afore-mentioned cartridge insertion preventing means; such a cartridge discriminating system is provided.

In a copier of this embodiment, a plural number of types of toners are housed in a common shape cartridge and replenishment of toner is made by displacement of the cartridge. Such a copier is, as shown in Figs. 3 - 5, comprised of an indication 22, being an example of cartridge in-

dicating means, which is formed on the outside surface of a cartridge 21 and corresponding to the type of toner, an indication detecting means 23 for detecting the afore-mentioned indication 22, when the afore-mentioned cartridge 21 is loaded into the copier not shown in this figure, an operation section 30 for selecting and specifying the indication to be used as the reference, a reference indication storing means 24 for storing the indication to be used as the reference which has been selected and specified by the afore-mentioned operation section 30, a comparing means 25 for comparing the signal from the afore-mentioned indication detecting means 23 with the information from the reference indication storing means 24 and a cartridge insertion preventing means 26 for permitting the cartridge 21 to be loaded, only when the signal from the afore-mentioned indication detecting means 23 and the information from the reference indication storing means 24 are in agreement with each other.

The afore-mentioned indication 22 is, as shown in Fig. 5(a), composed of a marker code 22' differentiated corresponding to the type of toner. This indication 22 is stuck on the bottom wall 21a at the end part, as seen in its loading direction (as shown by arrow 27) into the copier, not shown in this figure, of a cartridge 21 formed in a cylindrical shape and having on its side wall an opening 21' for supplying toner (sealed with a tape, when out of use).

The afore-mentioned indication detecting means 23 is composed of a plurality of photoelectric reflection type sensors 23', 23', ..., as shown in Fig. 5(b). This indication detecting means 23 is provided at a position on the front of the later described cover 28, being a component of the afore-mentioned cartridge insertion preventing means 26, and facing the marker code 22' of the cartridge 21, when the cartridge 21 is loaded into the copier. This indication detecting means 23 is connected to the input part of the I/O port 29 (refer to Fig. 3) which is linked to the later described CPU 25', being a component of the afore-mentioned comparison means 25.

Such an indication detecting means 23 detects the type of the cartridge 21 through combination of output signals from a plurality of photoelectric reflection type sensors 23', 23', which make on or off, corresponding to the marker code 22' of the cartridge 21, when loaded into the copier.

The afore-mentioned operating section 30 is composed of ten keys 30' (refer to Fig. 3) on the operation panel equipped on the copier not shown in this figure and is connected to the input part of the I/O port 29. By these ten keys 30', a set code corresponding to the marker code 22' of the proper cartridge 21 is input to the I/O port 29.

The afore-mentioned reference indication stor-

ing means 24 is composed of a nonvolatile RAM 24' and is linked to CPU 25'. This nonvolatile RAM 24' is used for storing the preset code corresponding to the marker code 22', which has been in put from the aforementioned ten keys 30' through the I/O port 29 and CPU 25'. The preset code may be rewritten, whereby it is possible to respond to use of different types of toners.

The afore-mentioned comparison means 25 is composed of such memories as ROM 31, RAM 32, etc., and CPU 25'; it compares the information from the indication detecting means 23 which has been entered through the afore-mentioned I/O port 29 with the preset code stored in the nonvolatile RAM 24' and when they are in agreement, delivers an operation signal to the later-described solenoid 33 of the cartridge-insertion preventing means 26.

The afore-mentioned cartridge insertion preventing means 26 is equipped with a set switch 35 as shown in Fig. 4, located in the neighborhood of the cartridge inserting part 34 of a copier, not shown in this figure. This set switch 35 is adapted to detect the afore-mentioned cartridge 21, when its end has been inserted into the cartridge inserting section, thereupon to start reading of the information from the afore-mentioned indication detecting means 23; it is connected to the input port of the afore-mentioned I/O port 29.

On the shaft 36 placed upward of the afore-mentioned cartridge inserting part 34, the cover 28 for opening - closing said cartridge inserting part 34 is movably slung to make free opening - closing. On the front of this cover 28, the indication detecting means 23 is mounted, as hereabove described. Further, at one end part (free end) of the cover 28, a part to be engaged 28' is formed.

Downward of the afore-mentioned cartridge inserting part 34, the solenoid 33 is fitted. On the armature of this solenoid 33, there is provided an engaging part 33' which engages with the part 28' to be engaged. Numeral 37 is a reset spring for the afore-mentioned armature. The afore-mentioned solenoid 33 is connected with the output port of the afore-mentioned I/O port 29.

When the afore-mentioned solenoid 33 is in off state, the afore-mentioned cover 28 is prevented from opening, with the engaging part 33' engaging with the part to be engaged 28' (the state shown by a real line in Fig. 4). When it is in the on state, their engagement is undone, making the cover freely openable, whereby loading of cartridge 21 is permitted (the state shown in Fig. 4 by a double dotted chain line).

Next, the operation of the apparatus composed as herabove described is described based on flow charts given in Figs. 3, 4 and 6.

Here, the codes S1, S2, ..., etc., in Fig. 6 show the numbers of respective process (step).

First, in order to select and specify, as an initial presetting, only the cartridge 21 in which a certain type of toner the user is to use is housed, the preset code corresponding to the marker code 22' of said cartridge 21 is inputted by operating the ten keys 30'. Said preset code is, then, stored in the nonvolatile RAM 24'.

Next, as an operator is to load a new cartridge into the copier, after drawing out a used cartridge, when replacing toner, an end part of said cartridge abuts on the set switch 35, as shown by a real line in Fig. 4; as a consequence, the set switch 35 is made on. At the same time, the marker code 22' of the cartridge 21 and the indication detecting means 23 on the cover 28 approach and face each other (S1). As a result, the information of the marker code 22' on the cartridge 21 is read into CPU 25' from the afore-mentioned indication detecting means 23 through the I/O port 29 (S2).

The afore-mentioned CPU 25' makes a comparison between the information of the afore-mentioned marker code 22' and the preset code of the afore-mentioned nonvolatile RAM 24'. When both codes are in agreement with each other (S3), the solenoid 33 is energized (S4) through I/O port 29. Then the engagement between the part 28' to be engaged of the cover 28 and the engaging part 33' of the solenoid 33 is undone; consequently, the cover 28 is brought into an openable state.

As a result, the cartridge 21 pushes and opens the cover 28 by its end part, for it to be loaded into the copier (the state shown by a double dotted chain line in Fig. 2).

At this time, the set switch 35 stays being in its on state, while the indication detecting means 23 fitted on the cover 28 detects a part other than the marker code 22' (a state identical to that in which the information of the marker code 22' and the preset code in the nonvolatile RAM 24' are not in agreement with each other, as later described, is brought about); therefore, the solenoid 33 is deenergized and reset to its state shown by a real line in Fig. 4 by the repulsive force of the spring 37.

On the other hand, when the information of the marker code 22' and the preset code of the nonvolatile RAM 24' are not in agreement (S3), that is, when an inadequate cartridge 21 has been inserted, the solenoid 33 will not be energized, but remain in its off state (S5). Accordingly, the engagement between the part to be engaged 28' of the cover 8 and the engaging part 33' of the solenoid 33 is not undone. Consequently, the end part of the cartridge 21 cannot push and open the afore-mentioned cover 28; thus, the cartridge cannot be loaded into the copier.

That is to say, loading into the copier of cartridges other than those whose codes have been

registered beforehand will be all prevented.

Next, when the afore-mentioned cartridge 21 is drawn out in the direction of the arrow 38, in order to take said cartridge 21 out of the copier, the cover 28 will swing downward, to restore its former state (the state shown by a real line in Fig. 4) by its own weight or by the action of a spring not shown, in this figure.

When the indication detecting means 23 on the cover 28 has reached the position where it again faces the marker code 22' of the cartridge 21, the information of said marker code 22' is again read into CPU 25' from the afore-mentioned indication detecting means 23; then, since it is in agreement with the preset code of the nonvolatile RAM 24', the solenoid 33 is energized. Thereby, the cover 28 returns to the real line position shown in Fig. 4.

As the afore-mentioned cartridge 21 has been completely taken out, the afore-mentioned solenoid 33 is again deenergized, so that it is restored to its former state by the repulsive force of the spring 37. Thus the part 28' to be engaged of the cover 28 and the engaging part 33' of the solenoid 33 are locked, making the cover 28 unable to open (the cartridge insertion preventing state is brought about).

As hereabove described, in this embodiment, it is not only possible to freely select and specify any appropriate one from among a plurality of cartridges by the use of ten keys 30', but once a cartridge is selected and specified by the afore-mentioned operation section 30, loading of cartridges 21 other than the specified one is prevented.

While in the afore-mentioned embodiment, the operation section 30 and the reference indication storing means 24 (refer to Fig. 1) are composed of ten keys 30' and a nonvolatile RAM 24', respectively, it is also feasible to compose them in such away as to input the preset code, using a DIP switch 39, to be stored by hard-ware as shown in Fig. 7.

Further, in the afore-mentioned embodiment, while the solenoid 23 is off, when the cartridge 21 is loaded in the copier, even though the preset switch 35 is on, it is possible to keep the afore-mentioned solenoid 33 always in its on state, so long as the set switch 35 is on, even when the cartridge 21 is loaded in the copier.

The processing procedure of this case is shown in the flow chart of Fig. 8. This flow chart gives a composition such that when the set switch 35 is in its off state, the solenoid 13 is also off.

Next, a modified form 26' of the cartridge insertion preventing means 26 is explained, based on Fig. 9.

The cartridge insertion preventing means 26' is nearly similar in basic structure as the afore-men-

tioned one shown in Fig. 4.

In said cartridge insertion preventing means 26', a bevel 33b is formed on the top surface of the engaging part 33a of the solenoid 33. Further, on the part of the cover 28 for hanging it by the shaft 36, a spring 40 for restoring the cover 28 is provided. The elastic biasing force of said spring 40 is so set that it can push down the armature in defiance of the elastic biasing force of the spring 37 attached to the solenoid 33.

Since the cartridge insertion preventing means 26' is composed as herabove described, the solenoid 33 need not be energized as in the case of the afore-mentioned cartridge insertion preventing means 26, when the cover 28 is restored to its former state (the state shown by a real line in Fig. 9). Thus the afore-mentioned cover 28 can recover its former state, while getting the part 28' to be engaged of said cover 28 abutting on and pressuring downward the afore-mentioned bevel part 33b by elastic biasing force of spring 40.

The processing procedure when the afore-mentioned cartridge insertion preventing means 26' is used is shown in a flow chart of Fig. 10. According to this flow chart, the system is so composed that when the set switch 35 is in off state or when the information code from the indication detecting means 23 in the comparing means 25 does not coincide with the set code stored in the nonvolatile RAM 24', the solenoid 33 is deenergized.

The indication 22 of afore-mentioned embodiment and the indication detecting means 23 (refer to Figs. 5(a) and (b)) may be composed of a printed pattern 22a and a CCD sensor 23a for detecting said pattern 22a (refer to Figs. 11(a) and (b)). For the afore-mentioned pattern, those differing in lightness or those with colors may be contemplated. As the indication detecting means in afore-mentioned embodiments, photosensors for detecting the light and shade or those for detecting colors may be employed.

Such cartridge indicating means and indication detecting means for detecting them shown in Figs. 5 and 11 are of course applicable to the embodiment shown in Fig. 1.

The afore-mentioned embodiment is so composed that the stored data may be freely updated, using a nonvolatile RAM 24' or a DIP switch 39 as a reference indication storing means, but use of ROM is permissible, when up-dating of the stored data is unnecessary or when exchange of storage element will do.

In the embodiment described hereunder, a data (indication) intrinsic to the developing device is attached to the developing equipment and this data and the indication attached to a cartridge are referenced to each other and when they are in agreement with each other, the state in which the

toner supplementation is possible is evidenced.

Thus this embodiment may be summarized as a cartridge discriminating system for image forming apparatus replaceably equipped with a developing equipment for developing static latent image by supplying toner to a photoreceptor, in which, while a cartridge indicating means is provided on a part of a cartridge for housing toner, a developing equipment indicating means is provided on a part of the developing equipment; and while an indication detecting means which detects the afore-mentioned cartridge indication means is provided on the image forming apparatus side, there is provided a developing equipment detecting means for detecting the afore-mentioned developing equipment, when the afore-mentioned developing equipment is attached to the image forming apparatus, so that when the cartridge is inserted into the cartridge inserting part of the image forming apparatus, the suitability of the type of the cartridge inserted may be detected by making a comparison between the indication data detected by the afore-mentioned indication detecting means and the data detected by the developing equipment detecting means.

While this embodiment is described in discriminating color toners color by color, it goes without saying that it is applicable to discrimination of toners on a basis of their other characteristics, etc.

Fig. 12(a) is an explanatory diagram showing a principal part of this embodiment, in which 61 denotes a developing equipment for red color to be replaceably mounted on a copier (not shown in this figure); 62A, a toner hopper for red color, being an example of a cartridge, which is replaceably mounted on the developing equipment 61; 63a and 63b, lead switches, being an example of developing equipment detecting means, which are, respectively, installed on the wall 65 of the copier; 64a and 64b, magnetic material pieces, being an example of developing equipment indicating means, which turn on respective lead switches 63a and 63b, when the developing equipment 61 has been mounted on the copier (in the state of Fig. 12(a)); 65a and 65b, lead switches, being an example of indication detecting means respectively installed on the developing equipment 61; 66a and 66b, magnetic material pieces, being an example of cartridge indicating means, for turning lead switches 65a and 65b on, respectively, when the toner hopper 62A is mounted on the developing equipment 61 (in the state of Fig. 12(a)); 67, a toner concentration sensor for detecting the toner concentration inside the developing equipment 61; 68, a toner supplementing roller for supplementing toner from the toner hopper 62A to the developing equipment 61; 69, a photoreceptor drum; 70, a devel-

oper roller for use in developing static latent image by supplying toner to the surface of photoreceptor drum 69; and 71 and 72, stirring rollers for mixing toner and carrier inside the developing equipment 61. In Fig. 12(b), 62B designates a toner hopper for blue, on which a magnetic material piece 66a is provided.

Fig. 13 is an electric circuit diagram showing an essential part of the control circuit for the apparatus shown in Fig. 12(a), in which R represents series connected resistances which respectively connect lead switches 63a, 63b, 65a, 65b to power sources V; I_{01} and I_{02} , exclusive NOR circuits each of which out-puts 1, when respective two input signals are both 1 or both 0; A_1 and A_2 , respectively AND circuits; S, a toner supplementing signal circuit which outputs 1, when the toner concentration sensor 67 (Fig. 12(a)) gives a value lower than the specified value; and M, a motor for turning the toner supplementing roller 68.

In this composition, as the red color developing equipment 61 and the red color toner hopper 62A are installed in place, lead switches 63a, 63b and 65a, 65b are respectively turned on by the magnetic material pieces 64a, 64b and 66a, 66b, respectively facing them. Referring to Fig. 13, into the exclusive NOR circuits I_{01} , I_{02} both 1 is inputted and both output 1. The AND circuit A_1 outputs 1 and, then, when the toner supplementation signal circuit S outputs 1, the AND circuit A_2 outputs 1; then, the motor M is driven, to let the toner supplementing roller 68 turn, until the toner supplementation signal circuit S outputs 0.

However, when a blue color toner hopper 62B shown in Fig. 12(b) is mistakenly mounted on the red color developing equipment 61, the lead switch 65b is turned off, and the lead switches 63a, 63b and 65a, on; therefore, the exclusive NOR circuit I_{01} outputs 1, but the exclusive NOR circuit I_{02} outputs 0. Accordingly, the output from the AND circuit A_1 becomes 0, so that even when the toner supplement signal circuit S outputs 1, the AND circuit A_2 does not output 1; consequently, the motor M will not run; thus, no supplementation of toner from the blue color toner hopper 62B will take place.

Thus in this embodiment, by the circuit shown in Fig. 13, the toner inside the developing equipment 61 and the toner inside the toner hopper 62 are judged to be the same type, only when the lead switches 63a and 63b and the lead switches 65a and 65b are in the same on - off combination state. In this way, discrimination can be made between different four color toners.

Fig. 14 is a diagram corresponding to Fig. 12(a) showing another embodiment, in which in place of the replaceable red color toner hopper 62A in Fig. 12(a), a toner hopper 62C equipped with a

replaceable red color toner cartridge 74 is integrally combined with a red color developing equipment 61. Further, in place of lead switches 65a, 65b installed on the red color developing equipment 61 in Fig. 12(a), there are installed lead switches 75a, 75b on the toner hopper 62C; in place of the magnetic material pieces 66a, 66b provided on the toner hopper 62A in Fig. 12(a), magnetic material pieces 76a, 76b on the red color toner cartridge 74; and in place of the lead switches 63a, 63b installed on the wall surface 65 of the copier, DIP switches 73a, 73b preset in closed circuit state on the red color developing equipment 61.

In this composition, when the developing equipment 61 and the toner cartridge 74 are respectively installed, as shown in Fig. 14, the control circuit of Fig. 13 will come into operation similarly as in the above-described embodiment.

Claims

1. A toner cartridge having a hollow container for housing powdered toner, and cartridge indicating means (6, 9, 22', 22a) for indicating the type or position of the cartridge, characterized in that said cartridge indicating means is a magnetic card (6), an IC card (6), a small container (9) containing a developer of the same type as that of the toner and a carrier housed in the cartridge, or a mark (22', 22a) printed on said cartridge.
2. An image forming apparatus including a cartridge inserting part for receiving a toner cartridge of the type claimed in claim 1, and indication detecting means for detecting the suitability or position of the cartridge inserted into said cartridge inserting part, wherein said indication detecting means is a magnetic head, an analyzer for reading out an IC card, a permeability sensor (11) or an optical sensor (23', 23a) for detecting a pattern, respectively.
3. A cartridge discriminating system comprising a toner cartridge as defined in claim 1 and indication detecting means as defined in claim 2.
4. A cartridge discriminating system for an image forming apparatus which is provided with a replaceable developing equipment (61) for supplying toner to a photoreceptor (69) for developing static latent images, said cartridge discriminating system comprising cartridge indicating means (66a, 66b, 76a, 76b) provided on a toner cartridge (62A, 62B, 74), and indication detecting means (65a, 65b, 75a, 75b) provided on the image forming apparatus and

cooperating with said cartridge indicating means for detecting said cartridge when the latter is inserted into a cartridge inserting part of the image forming apparatus, **characterized by** developing equipment indicating means (64a, 64b, 73a, 73b) provided on said developing equipment (61), developing equipment detecting means (63a, 63b) provided on the image forming apparatus and cooperating with said developing equipment indicating means for detecting said developing equipment when the latter is attached to the image forming apparatus, and means (IO₁, IO₂, A₁), for checking the suitability of the type of the inserted cartridge by comparing an indication item detected by said indication detecting means (65a, 65b, 75a, 75b) with data detected by said developing equipment detecting means (63a, 63b).

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5. A cartridge discriminating system as defined in claim 4, wherein said cartridge indicating and indication detecting means comprise pieces of magnetic material (66a, 66b, 76a, 76b) and lead switches (65a, 65b, 75a, 75b) adapted to be actuated by said pieces of magnetic material.

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6. A cartridge discriminating system as defined in claim 4 or 5, wherein said developing equipment indicating and detecting means comprises pieces of magnetic material (64a, 64b) and lead switches (63a, 63b, 73a, 73b) adapted to be actuated by said pieces of magnetic material.

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Fig 1

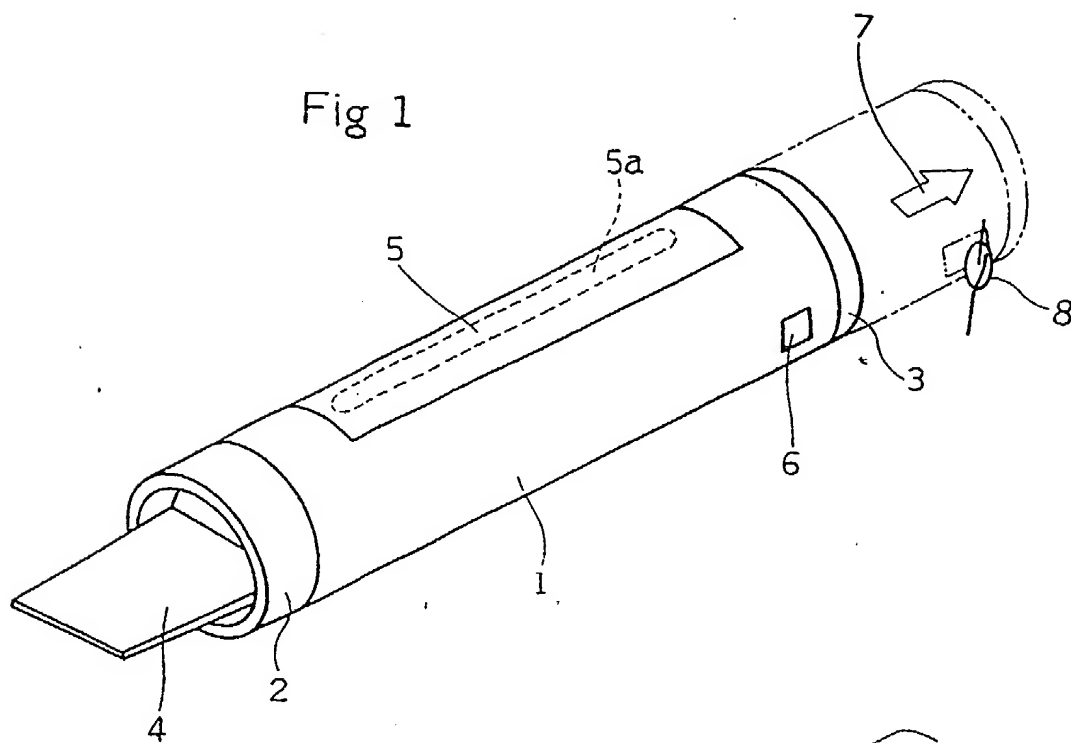


Fig 2

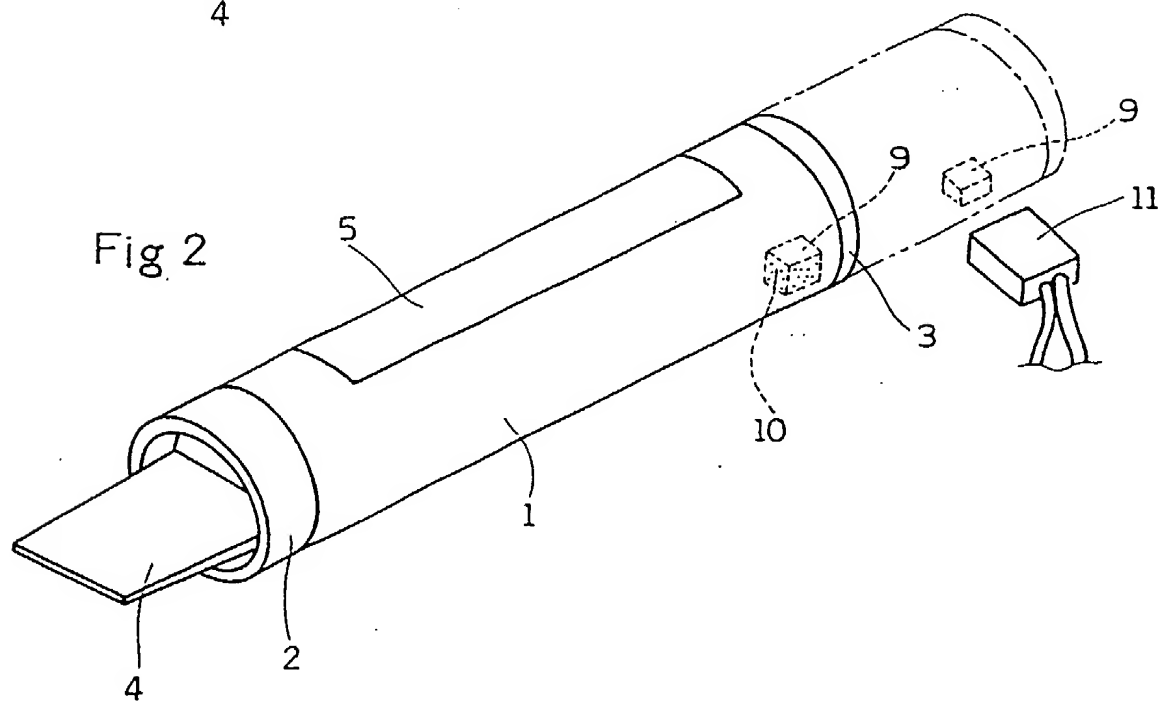


Fig 3

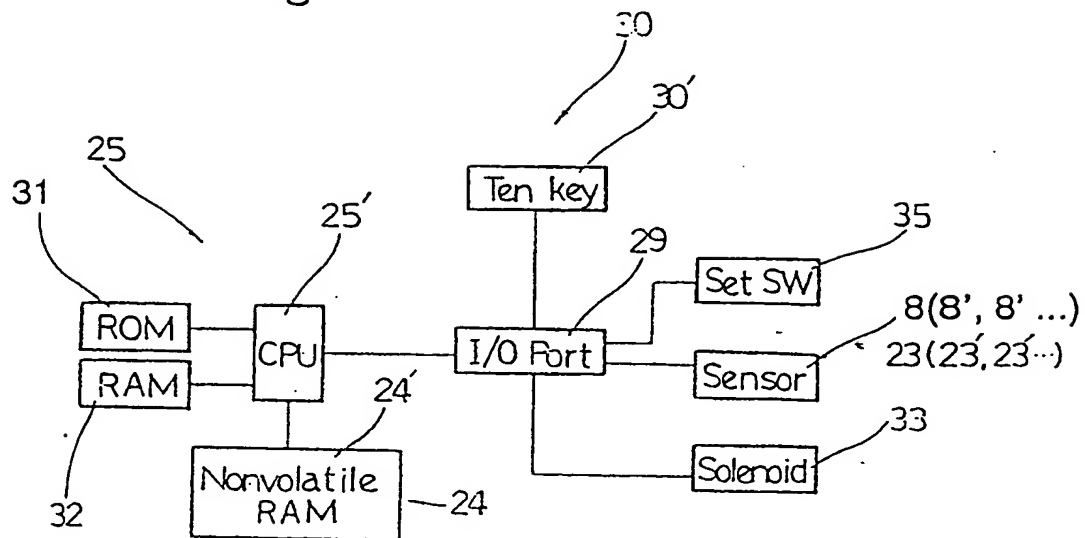


Fig 4

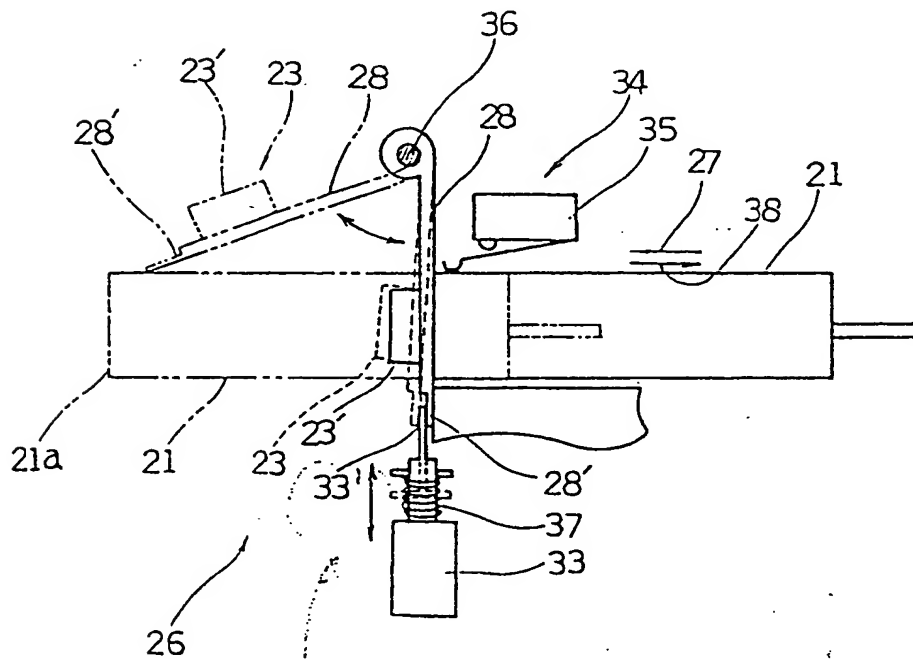


Fig 5

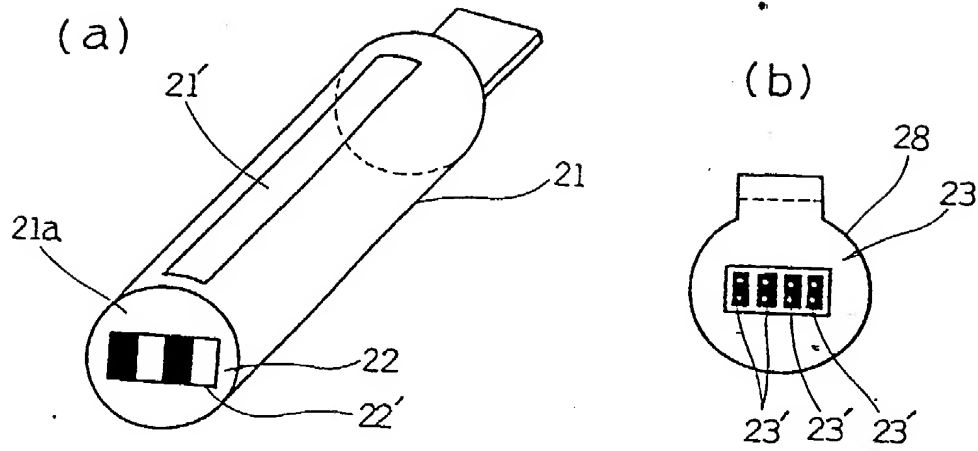


Fig 6

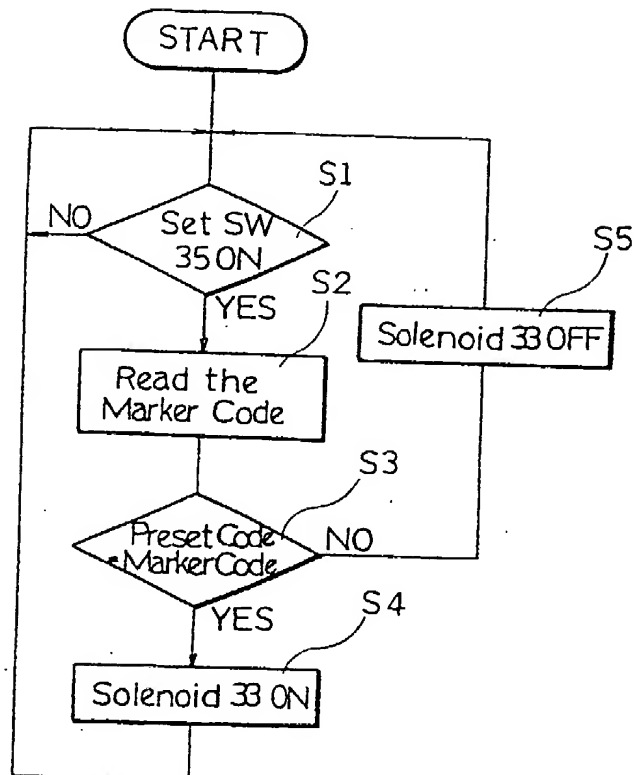


Fig 7

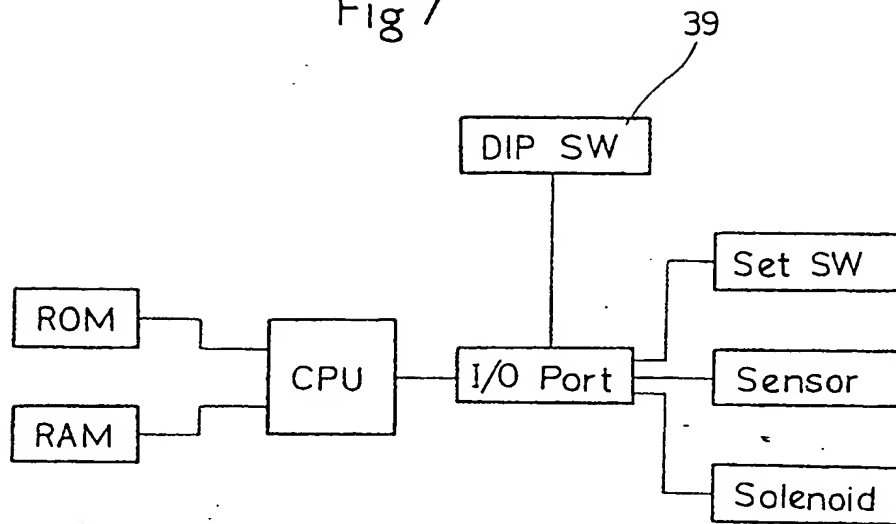


Fig 8

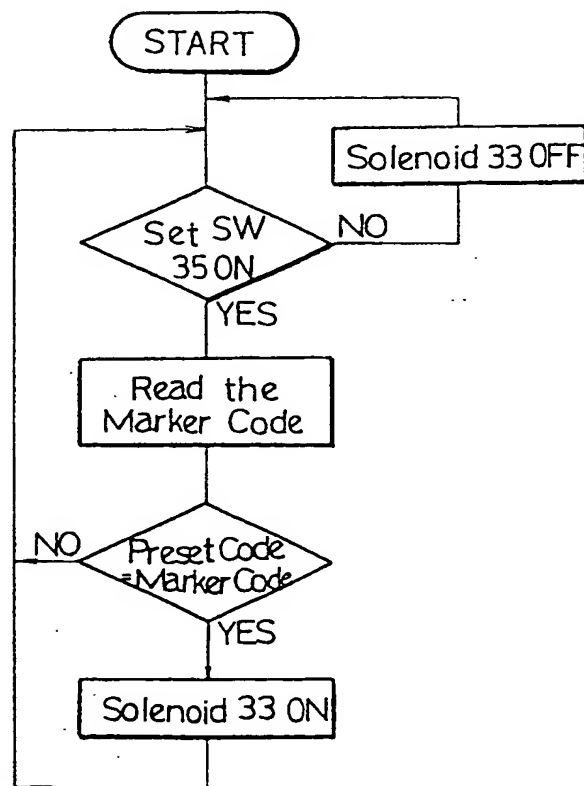


Fig 9

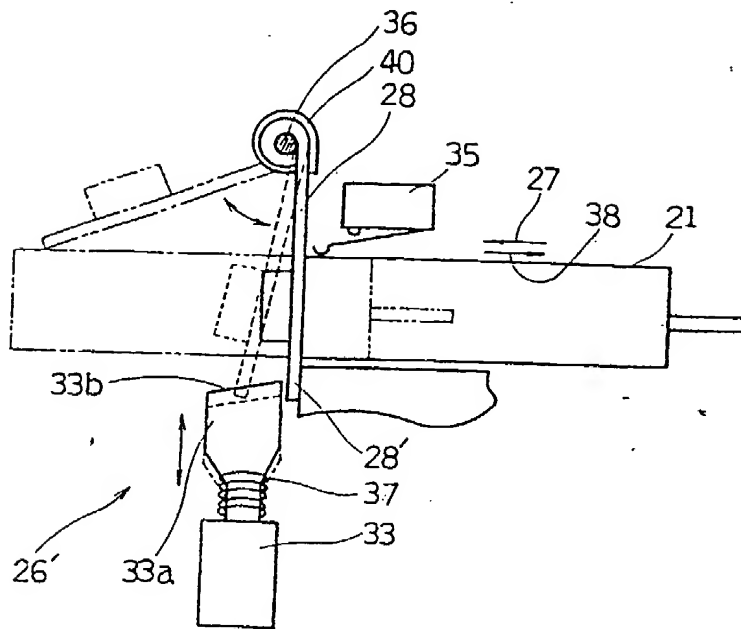


Fig 10

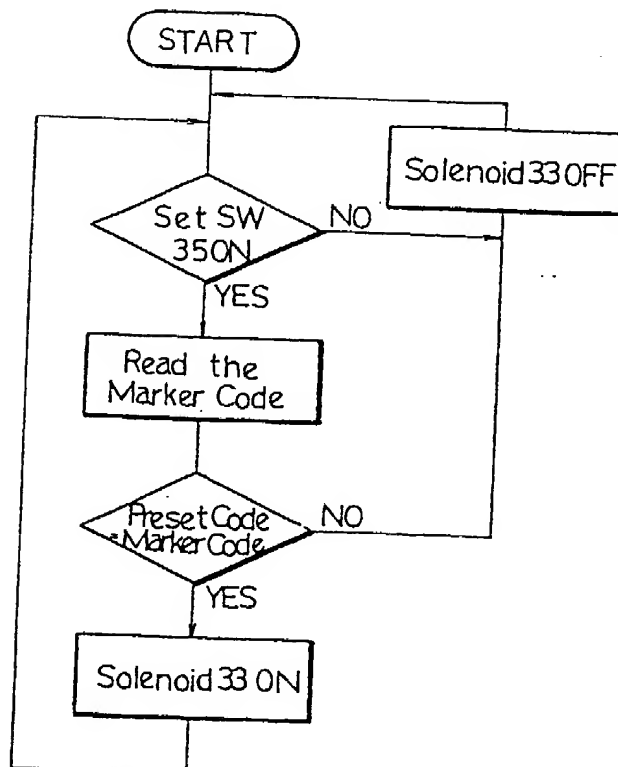


Fig 11

(a)

(b)

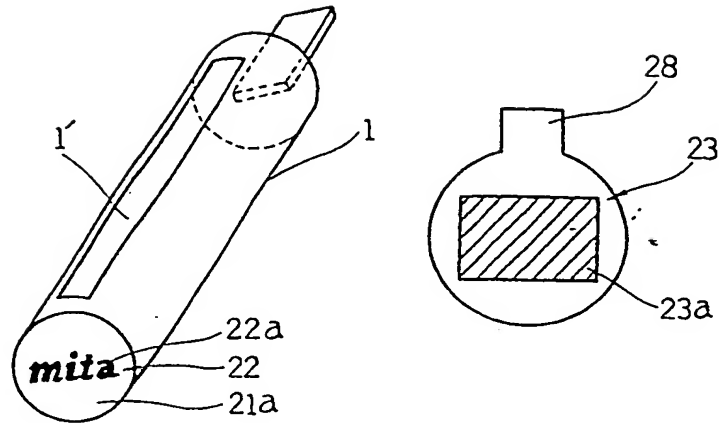


Fig 12

(a)

(b)

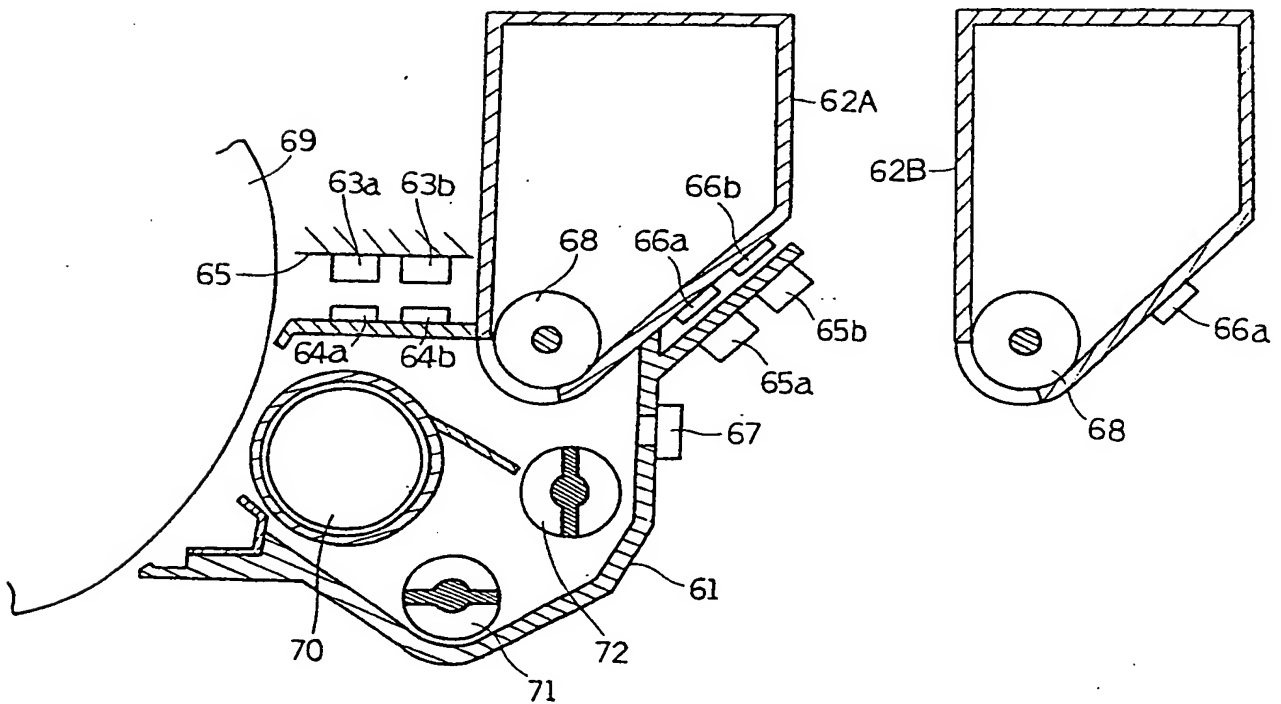


Fig13

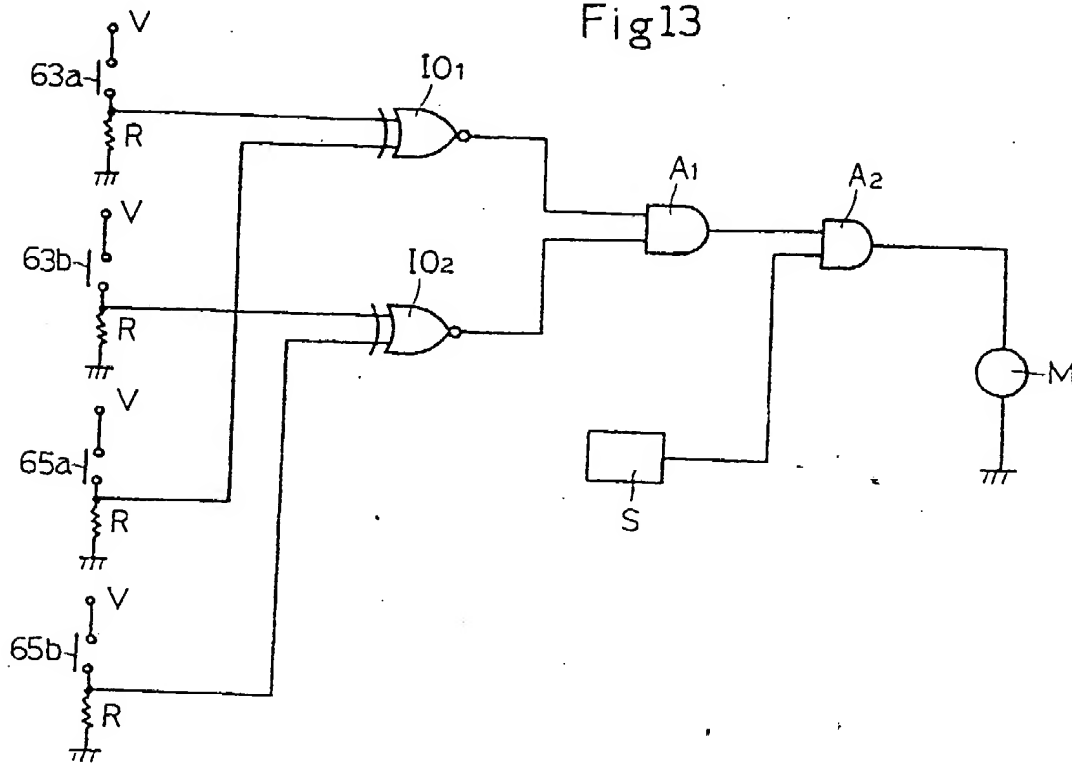
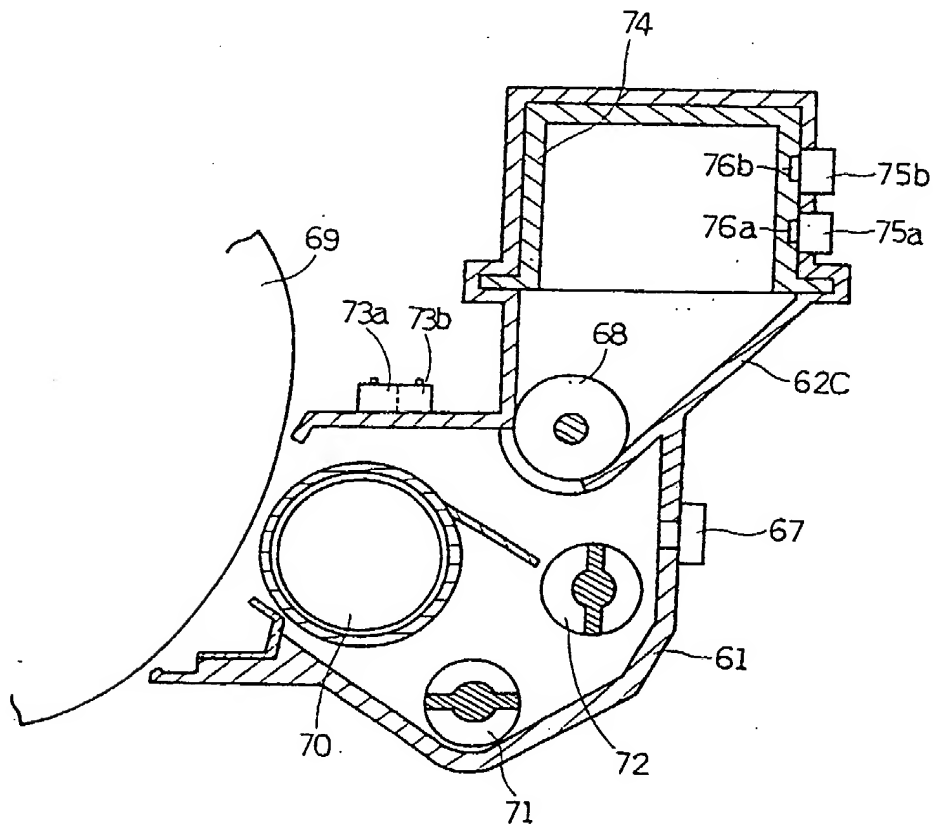


Fig 14





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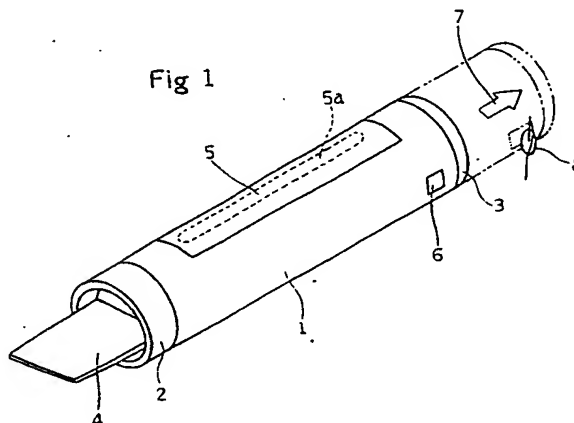
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(54) Cartridge discriminating system.

(57) A cartridge discriminating system, a toner housing cartridge adapted for use in such a system and an image forming apparatus provided with such a system, wherein a cartridge indicating means (6) is provided on a part of the toner housing cartridge (1), and an indication detecting means (8) for detecting said cartridge indicating means (6) is provided on the image forming apparatus for detecting the type or position of the cartridge inserted in the image forming apparatus.





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EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 91122030.9
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. CL.5)
X	<u>US - A - 4 579 443</u> (ABUYAMA) * Fig. 10, 11A, 11B; column 8, lines 49-62 *	1	G 03 G 15/08
A	* Fig. 1, 10, 11A, 11B; abstract; claims *	2-6	
X	<u>US - A - 4 605 299</u> (MOCHIMARU) * Fig. 1; abstract; claims *	1	
P, X	<u>US - A - 4 666 290</u> (YOSHIURA) * Fig. 1; column 2, lines 35-60 *	1-3	
P, A	* Fig. 1, 3, 4; column 2, lines 35-60 *	4, 5	
A	<u>US - A - 3 385 500</u> (LAVANDER) * Fig. 2, 3; column 3, lines 35-37 *	1	
			TECHNICAL FIELDS SEARCHED (Int. CL.5)
			G 03 G 15/00
The present search report has been drawn up for all claims			
Place of search VIENNA		Date of completion of the search 14-02-1992	Examiner KRAL
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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